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CHEMICAL & ENGINEERING

NEWS

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Cosmetics

Chemical specialties that do more than cover up **Page 21**

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CHEMICAL & ENGINEERING NEWS

APRIL 4, 1988

News of the Week

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■ **The Army's plans for a biological warfare testing facility in Utah are drawing heavy criticism from an environmentalist, Congressmen, state officials, and the Mormon Church.** **Page 5**

■ **U.K. chemical capital spending for the 1988–90 period will be up a hefty 36% over the 1985–87 outlay, according to a Chemical Industries Association survey.** **Page 5**

■ **Koppers is receiving assistance from state officials in Pennsylvania in its battle against a takeover bid from BNS Inc., which is controlled by British builder Brian Beazer.** **Page 6**

■ **Government and industry efforts to improve energy efficiency have lost momentum, need revitalizing, says a study by Worldwatch Institute, a private research group.** **Page 6**

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Product Report

Traditionally used to enhance appearance, cosmetics today are moving toward more body-care uses, such as prolonging or protecting the health of the skin or hair. **Page 21**

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LETTERS

CHEMICAL SAFETY

Unstable metal nitrates

SIR: The addition of an aqueous solution of SnF_2 to an aqueous solution of some divalent metal nitrates $M(NO_3)_2 \cdot xH_2O$, (M = Sr, Ba, and Pb) produces the immediate precipitation of tin(II) fluoride containing materials that are stable in air at room temperature [Donaldson, J. D., et al., *J. Chem. Soc.* (A), 1821 (1967); Denes, G., et al., *C. R. Acad. Sc. Paris*, **280C**, 831 (1975)]. I wish to report here the occurrence of the explosion of the product obtained from a similar reaction using magnesium nitrate hexahydrate.

A 1.5M aqueous solution of SnF_2 (3.205 g in 10 mL) was added dropwise (10 mL in 90 seconds) to an aqueous solution of $Mg(NO_3)_2 \cdot 6H_2O$ (2.622 g in 10 mL) upon stirring, at room temperature, in a Nalgene beaker. Contrary to the cases of Ca, Sr, Ba, and Pb, no immediate precipitation was obtained. After evaporating seven days at room temperature, a wet white solid was obtained. In order to accelerate drying, the beaker was placed on the roof of a drying oven, at 47 °C. After 80 minutes, it was allowed to cool to room temperature and a weight loss of 0.367 g was measured; however, the white solid was still wet. To accelerate further the drying process, the product was scraped from the bottom of the beaker and cut into small pieces with a spatula. As I was cutting it, the white wet solid suddenly exploded violently. A brownish gas was evolved, most likely NO_2, and a significant amount of the solid was blown out of the beaker. To my surprise, I realized that there was no more wet white solid, but instead a large amount of khaki-colored fine dry powder, which turned bright yellow overnight. The beaker was cold and undamaged. My fingers that were holding the spatula showed a slight brownish skin color on the side exposed to the beaker, probably surface skin oxidation by NO_2 vapor. It did not cause any discomfort and disappeared in a little less than a week. ^{119}Sn Mössbauer spectroscopy showed that only tetravalent tin was present, similar to that found in SnO_2; however, x-ray powder diffraction showed the sample contained no crystalline SnO_2.

The white wet solid was probably a nitrate-containing phase, highly unstable when submitted to a mechanical shock, even moderate, or when exposed to atmospheric oxygen. Explosion of silver nitrate being recrystallized from ethanol has also been reported (C&EN, Jan. 12, 1987, page 2) to occur upon application of a minor mechanical energy using a spatula. This further stresses the danger of working with nitrates and metals in fairly unstable oxidation states. Violent oxidation of tin(II) to tin(IV) with simultaneous reduction of nitrogen(V) (NO_3^-) to nitrogen(IV) (NO_2) occurred. Fortunately, the product was contained in a nonsealed container preventing pressure buildup and a more violent explosion. The lesson to be remembered is that some of these "innocentlike" reactions can be potentially dangerous.

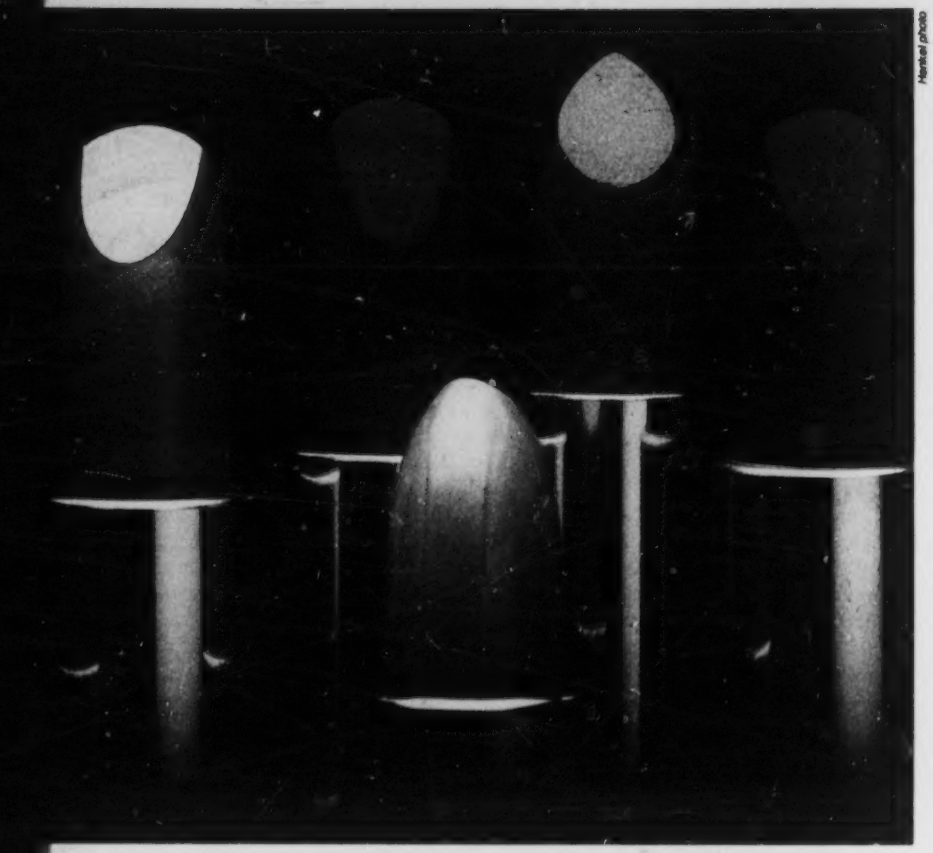
Georges Denes
Assistant professor
Concordia University, Montreal

Academic job market

SIR: On behalf of all of the recent chemistry Ph.D.s in search of an academic career, we wish to call attention to a portion of the ACS Comment by Paul Gassman (C&EN, Dec. 14, 1987, page 51). The conclusion reached by Gassman that "there are more than twice as many faculty openings than there are individuals who desire academic positions" is shaky at best. We only wish there were two openings for every applicant. Our recent experience of applying for tenure-track physical chemistry positions leads us to believe that there are at least three or four applicants per job. Last year we each applied for about 25 physical chemistry positions. Based on our rejection letter statistics, there were at least 100 applicants for most of these positions.

Gassman attributes the presence of so many vacancies to low-quality applicants. This may explain the vacancies at some top-ranked institutions, but it cannot explain the presence of the large number of openings at smaller colleges and universities. Research-oriented candidates are often rejected by these institutions for being "overqualified." It seems that many departments do not have a well-defined policy for promoting research as an essential part of the undergraduate and graduate educational process.

The main issue we wish to raise is that things are not nearly as simple as a quick analysis of percentages and numbers would indicate. There are many well-qualified individuals looking for academic jobs: men and women hoping to devote their energies to teaching and



Henkel photo

Cosmetics

Body care eclipses coverup in some uses

Patricia L. Layman, C&EN London

Historically, cosmetics and toiletries have been tools of adornment, for such uses as adding color to the face, cleansing the hair and body, and whitening the teeth. But lately, there has been a decided move from just "cosmetic" adornment for the sake of esthetics toward more scientific, or quasiscientific, uses that do something good for the human body.

In this new genre of products, skin-care formulations aim to prolong the good health and appearance of skin. Sunscreen products protect against ultraviolet rays and perhaps against skin cancer. Even simple shampoos aim to protect and condition the hair through the cleansing process.

With these changing demands on the cosmetics and toiletries business, corresponding demands arise for the suppliers of raw-material ingredients. Cosmetics companies are dependent on what suppliers can come up with, so are pressuring for more, better, and, increasingly, milder ingredients.

It is certainly an end-use market for which new developments are worth working on. According to one estimate, U.S. retail sales of cosmetics and toiletries last year amounted to $23.7 billion. Retail sales in Western Europe weren't far behind at nearly $19 billion, and in Japan they probably approached $14 billion. Add another $12 billion to $15 billion estimated for the rest of the world, and the grand total spent by people around the world for "adorning" themselves comes to about $70 billion.

In turn, global sales of the chemical ingredients in cosmetics probably represent about 10% of that market, or about $7 billion, if earlier ratios that consultants such as SRI International worked out still hold. It is a widely fragmented market, with more than 1000 chemicals employed routinely as cosmetic ingredients. Many more are used less frequently or only in certain countries. In the U.S., at least, an overall yearly growth rate of just under 6% in current dollars is expected to 1990.

Consultant firm Frost & Sullivan, in a report on cosmetics raw materials published last year, argues that fragrance ingredients are the crucial materials for cosmetics, with the influence of scent extending far beyond that of the classic perfume blends. In fact, the consultants say, almost as many "perfume and aroma chemicals are going into hair-care products as into perfumes and colognes themselves." As a group, only oral hygiene products—toothpastes, mouthwashes, and the like—"are without fragrance ingredients in their formulations." Even that proves the point, however, because that category is highly dependent upon flavoring materials, which are basically a subset of fragrances.

Fragrances account for nearly a quarter, by value, of all ingredients used in cosmetics and toiletries, although when measured by weight, they constitute far less than 1% of all ingredients. They have the highest cost per pound of any chemical or ingredient class: an average of $22 per lb for fragrance components, although some of the rarer essences or oils can cost up to $3000 per lb. Lab emphasis is on producing synthetics to replace natural substances,

Distinction between cosmetics and pharmaceuticals is narrowing

Every few years there is a spate of quasidrug products claiming to do all sorts of good things, and those claims are usually shot down quickly by the Food & Drug Administration.

The latest batch of such products has been the anti-aging products, which by one estimate have already rung up sales of $100 million in the U.S. alone, out of a $1.8 billion skin-care market. One of the first of this group was Glycel, from Suisse Laboratories in Europe and Alfin Fragrance in the U.S., marketed under the aegis of heart surgeon Christiaan Barnard.

This was followed by Christian Dior's Capture and Lancôme's Niosome. Dior claims that Capture is especially efficacious because of its method of incorporating liposomes into a skin-care formula. The company says its "complex liposomes" are made of natural microencapsulated phospholipids that have a molecular structure identical to that of cell membranes. Thus, says Dior, they can biologically blend with the cellular membrane to restore fluidity and promote the exchange of vital elements.

Lancôme's Niosome contains microscopic lipidic spheres said to match the skin's intercellular system while also transporting active elements to the more distressed areas of the skin, counteracting the early breakdown of cell cohesion and treating the underlying causes of aging skin. And similar claims hold good for others of the new generation of anti-aging creams marketed by cosmetics giants Chanel, Charles of the Ritz, Esteé Lauder, and Guerlain.

One of the most direct scientific approaches has been that of the Japanese cosmetics giant Shiseido, with its B.H-24 treatment fluids. These are sold in prestigious London department stores for more than $100 for two 1-oz bottles. The package labeling proclaims the presence of the sodium salt of hyaluronic acid, at 0.12% for the day essence lotion and 0.15% for the night treatment fluid. Lots of cosmetics packages, of course, contain all sorts of fancy products. But very rarely do you find a package—handsome, matte-silver-coated plastic case—emblazoned with the molecular structure of the product's active ingredient, as Shiseido's package so strikingly does.

Use of the representation of the hyaluronic acid molecule as a marketing point has intrigued chemical suppliers in Europe, none of whom can remember quite the same emphasis being put on the chemistry of a product, particularly in an environment where "natural" products are highly popular. One possible explanation for the decision, says one supplier, is that "You can do this when you sell through a department store, and the counter girl can explain it. You can play more the technical game. Besides, if you charge $50 for a little tube of cream, you have to say something to make it believable."

Says Shiseido in an advertisement clearly directed at an American audience but published in a glossy U.K. publication, "Two minutes a day. Radiant, healthy, younger-looking skin. Shiseido B.H-24. Just a few drops of moisturizing, protective Day Essence in the morning. The same amount of revitalizing Night Essence before bed. Shiseido understands precisely how your skin works, day and night. So they have simplified the science of caring for it. Using Japan's most advanced biotechnology, Shiseido scientists have duplicated the moisture-binding substance plentiful in infants' skin. This exclusive humectant fortifies every single drop of B.H-24: two perfectly compatible formulae for round-the-clock treatment. Your time is as precious as your skin. Now you can make the most of both."

Hyaluronic acid as a humectant is one of the latest magic chemical ingredients for cosmetics companies to turn to. However, one indication that this area of cosmetics may be moving from art to science is the willingness of Johnson & Johnson to go through the time-consuming (and dollar-consuming) new drug application course for its retinoic acid-based cream for removing wrinkles—a course not lightly chosen.

Marketers have had to walk a fine line because of FDA's active interest in promotion claims. Late last year, for example, FDA stepped in and told several cosmetics companies their claims were off-base: relabel or reformulate. And the agency sent letters to a number of other companies cautioning that claims were borderline drug claims.

Retinoic acid—vitamin A—has been used as an acne treatment for many years, and recent research also has indicated that it may be effective in treating serious, rare forms of psoriasis. The wrinkle-removing aspect, however, is new.

The question that Johnson & Johnson will be attempting to answer in its new drug application is whether it works. The next question then will be, if it does work, would its near-relatives and derivatives?

Says one consultant, "Other than retinoic acid, people are playing games with close relatives, such as retinyl palmitate. The Germans use retinyl propionate; they have used retinoic acid itself in creams a long time. In the U.S., it is for prescription only, for acne. There is

whose supply can be erratic and quality inconsistent.

Synthetic surfactants are the largest cosmetic raw material segment, with estimated 1988 U.S. sales of 550 million lb, says Mark Chandler, an analyst with consultants Kline & Co. Shampoos provide the largest outlet for these. In order of volume, the three major surfactants used in shampoos are lauryl sulfates, lauryl ether sulfates, and α-olefin sulfonates. Smaller but still significant surfactant groups include amphoterics and sulfosuccinates.

In Western Europe, surfactant sales for cosmetics and toiletries totaled slightly more than 300 million lb last year—about 7% of total surfactant consumption—valued at about $250 million. Anionic surfactants, used primarily in shampoos and bath products, led the way with 207 million lb worth $141 million, followed by nonionics, which feature in creams, shampoos, and bath products, at 62 million lb valued at $55 million. The more specialized surfactants such as amphoterics for shampoos and bath products accounted for 26 million lb, valued at $41 million, and cationics, which go mostly into hair conditioners, 6.6 million lb valued at $11 million.

Advertising and promotion continue to be extraordinarily impor-

B.H-24 brochure depicts molecular structure of product's active ingredient

a great trade in Tijuana for Americans buying Johnson & Johnson's retinoic cream there without prescription. It's slightly hogwash. Marketers are playing at the fringes of the retinoic acid publicity that Johnson & Johnson got, with products for which they don't need a new drug application."

One ingredient supplier points out that retinoic acid has long been used by many researchers as a reference standard for cell-renewal products, because of its effects on skin cells. "It's a systemic effect," he says. "One of the mechanisms is revving up the skin cells, so they slough off faster. When a person stops using it, the skin is in better condition." Some researchers had looked at retinol, the alcohol version, as a less irritating chemical, but the effect is apparently not there. "What FDA is worried about is that retinoic acid really revs up the cells, increasing the turnover of cells. The concern is to make sure that the cell turnover rate will decrease when you stop; otherwise, you wind up with what is basically a skin cancer."

All the studies have been for treating chronic acnes, without scar tissue. "For wrinkled, normal skin, you could probably cut the concentration way down," he says, probably to about 0.01% or even less. Such low concentrations would be fairly innocuous and cause little or no irritation, especially if compounded into a nice cosmetic vehicle. He predicts that Johnson & Johnson will move as quickly as possible with its trials. "People here are clamoring for it. These will be the next wave of products."

Similarly, Upjohn is seeking the seal of respectability for its minoxidil as a baldness treatment. The material, which has stimulated considerable hair growth in about a third of those who use it, is currently being sold under the tradename Regaine in Canada and Europe, but it is awaiting approval in the U.S. as a prescription drug.

Other marketers, with various herbal or synthetic products, stop short of making claims that they can get hair to grow again, thus avoiding the drug licensing process. Instead, they promise scalp treatments to lengthen the natural hair-growing cycle, thereby improving the condition of existing hair.

It's all for a good cause, as they see it. Thinning hair affects half of American men by their 50th birthday, and a smaller percentage of women. Spurred by the promise of minoxidil, U.S. sales of cosmetic hair treatments ultimately could reach $1 billion a year, analysts say, up from $20 million actually sold before Upjohn submitted the material to FDA for approval in late 1985. Estimates of potential annual sales for minoxidil itself range from $50 million to $250 million. The tonics and lotions are not cheap. The cost of minoxidil, meant to be taken on a permanent basis, is expected to be about $800 a year.

tant in the cosmetics and toiletries industry. Consultants at Business Trend Analysts, for example, point out that the early marketing campaign for Calvin Klein's Obsession perfume in 1985 cost $17 million. "Is this sort of advertising budget indicative of future expenditures of upscale fragrances?" they ask rhetorically. And the answer quite probably is yes—but worth every penny if the product is a winner. After all, back in 1982, Opium fragrance from Yves St. Laurent was estimated to gross over $100 million a year, with designer perfumes accounting for nearly half of total perfume and fragrance sales in value terms.

However, the industry increasingly values any help it can get from the scientific realm, as it emphasizes products such as skin care and sun protection, even if this conflicts with the attractiveness of claims

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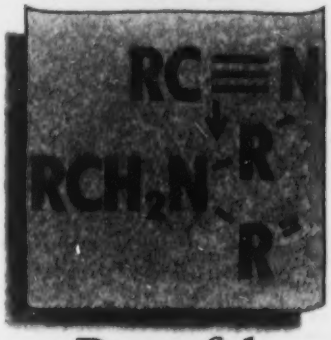

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about "natural" products or ingredients. As Joel Houston, a consultant with Colin A. Houston & Associates, puts it, "The industry acknowledges that people respect 'scientifically proven' for a scientific or quasiscientific claim, more than the 'natural' claim. But it's awfully hard to get a scientifically proven claim."

Nonetheless, cosmetics marketers are striving for just those claims, as they follow and strengthen the trends affecting the industry. Skincare products show increasing use partly because of an increasing concern about health and beauty, and partly because some consumers are starting to use these products earlier, as standards of living rise. There is a general concern about the damage to skin from overexposure to the sun over the years. And increasing numbers of male consumers are being lured to skin-care products and grooming aids.

Driving many of these trends is the inescapable demographic change affecting much of the industrialized world: the graying of its populations. In the U.S., women aged 35 to 44 currently represent the fastest-growing segment of the population. The most rapid growth in the 1990s, however, will be the sector of the populace aged 45 to 54. By the year 2000, the largest single age group will be the senior segment, aged 55 and older.

Demographics are already playing a significant role in the industry's growth. As the vast postwar baby-boomers move through life, with the discovery of distinguished silver bits at the temples, or the deepening laugh lines around the eyes, skin-care and hair-care products suddenly become rather more interesting than before. The emphasis is on mildness—a caress rather than a vigorous scrub.

In addition, with disposable income increasing, people can afford to take better care of themselves. As Kline consultants point out, marketers respond to this trend by developing products targeted at this group, and more likely specific segments of the 30-plus populations. For example, toothpastes that promote specific properties such as plaque and tartar control are of greater importance to older consumers than cavity prevention. Similarly, women's facial treatments, in particular the prestige lines, are fueled by heightened consumer interest.

In hair care—the largest cosmetics and toiletries segment—mildness is the word; more frequent shampooing leads to demands for less stripping surfactants. How manufacturers in various countries accomplish this will often differ markedly.

In the U.S., for example, probably 70% of shampoos are clear and only about 30% pearlescent (that excludes the antidandruff shampoos, which are opaque formulations because the active ingredient isn't soluble). Peter Walters, manager of personal-care and cosmetics ingredients for ICI Americas, explains that "Apparently in shampoos, adding pearlescent agents gives the impression that this is not a pure clean product, that it leaves something on the hair. We want something 'squeaky clean,' and clear reinforces that image."

Kline's Chandler adds: "In the U.S., pearlescents are perceived as having a conditioning effect. Clear equals clean; cloudy or pearly equals

Haircare dominates U.S. cosmetics and toiletries

$ Billions	1987 retail sales
Hair care	$5.398
Perfumes & colognes	3.410
Skin care/emollients	2.530
Hand, face & body soaps	2.220
Oral hygiene	2.183
Eye makeup	1.746
Deodorants, antiperspirants	1.610
Lip care	1.094
Face makeup	0.933
Nail care	0.634
Shaving, depilatories	0.582
Sunscreens, tanning products	0.487
Powders	0.358
Miscellaneous	0.495
TOTAL	$23.680

Sources: Frost & Sullivan, C&EN estimates

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W.W. Porterfield
Dept. of Chemistry, Hampden Sydney College

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conditioning. A lot of people don't like the idea of having the two-in-one product. There's not the same perception in West Germany and the rest of Europe."

In fact, market data at Henkel, a West German chemical producer, indicate that probably 80% of all shampoos there are pearlescent, including nearly all the cheaper private-label products and three quarters of the more expensive shampoos. There, the perception goes, "clear equals empty." Much better instead, the thinking goes, to have a shampoo packed full of good things for the hair, to care for it while cleaning it.

And in one of the newest markets for sun-care products, protection is the major preoccupation. Once the province of the glamorous ski bunnies at St. Moritz or the bronzed surfers on Waikiki beaches, sun-care products have become a significant hot market after a period of quiet during the 1970s and early 1980s.

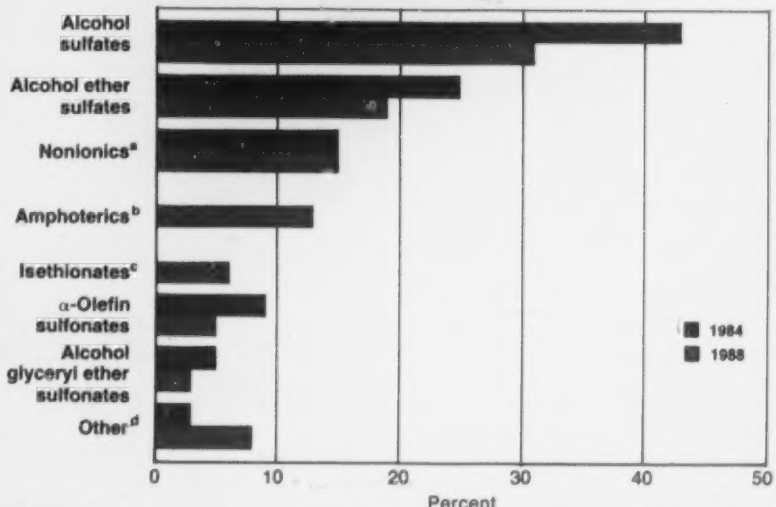
At about the turn of the decade, sunscreen makers were tapped by the Consumer Product Safety Commission, which decided to encourage sunscreen use with informative labeling systems. It was a marketer's dream to be able to say something to the effect "liberal and regular use may help reduce chances of premature aging and wrinkling of skin, and skin cancer, due to long-term overexposure to sun."

The sun protection factor (SPF) numbering system was developed to relate protection to natural skin protection. A suntan lotion of SPF 4, then, would provide four times the skin's natural sunburn protection. A sunscreen cream of SPF 15, the maximum in the early days of the system, was designed essentially as a sun block.

Sunscreen active ingredients were formulated into the obvious products—suntan lotions and creams, sun block creams, and lip protection creams. But eventually marketers began putting them into other cosmetics and toiletry products as well—cosmetic foundation creams, for example, good for a consumer to wear in the yard to do gardening, or out and about in general activity—as awareness of the problem of skin cancer grew.

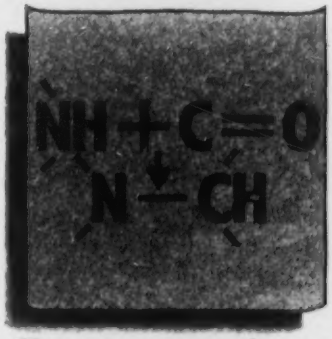
Now, says ICI's Walters, the sun-care market is "in a regulatory turmoil," as some companies promote products with SPF ratings of 30, 39, and even more. The Food & Drug Administration, he points out, is questioning whether ratings beyond about 15 are realistic. "It has become just a numbers game. You can demonstrate this in a laboratory, but

U.S. cosmetics and toiletries industry's surfactants use pattern has changed markedly



a Includes alkanolamides. b In 1984, included in "other" category. c Synthetic soaps. d Includes alcohol ethoxylates and fatty amine oxides. **Sources:** Kline & Co., C&EN estimates

Reductive Amination.



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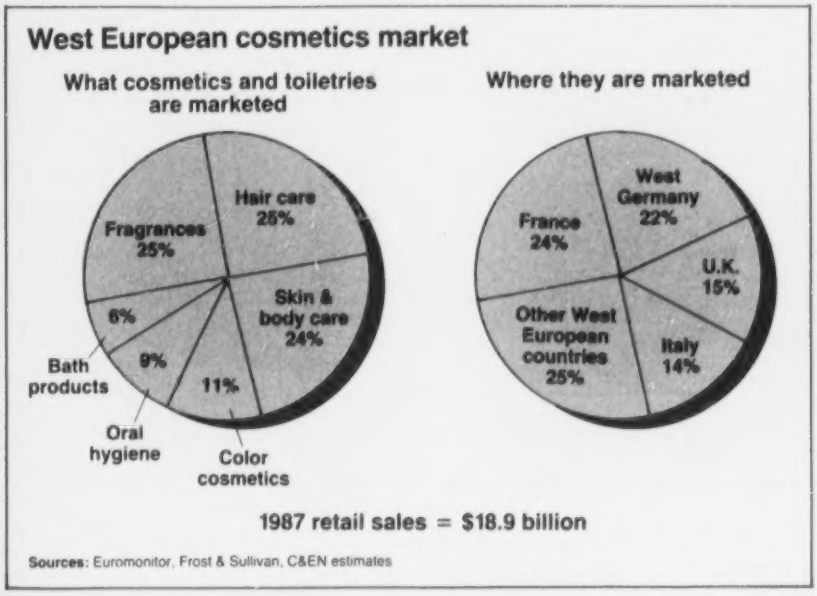

it is meaningless. People are not that much exposed," he says. On the other hand, "dermatologists are saying that any incremental benefit is an improvement. FDA probably will make a ruling soon on what the upper limit should be."

In the meantime, he believes, there is some movement away from octodimethyl *p*-aminobenzoic acid (PABA), one of the more popular sunscreen active ingredients, because of toxicity concerns. "There is a lot of product reformulation as people are getting ready for the summer. They're using methoxy cinnamate compounds and other sunscreens. We have programs under way on the benzophenone and cinnamate markets, and a program to investigate new sunscreen materials for the 1990s and beyond. The market had been fairly static for a while."

In some respects, this reformulation is a U.S. trend. Says Walters' colleague Jean-Marc Suter, general manager for surfactants at ICI Europa, "In Europe, the market is mostly a range of cinnamates. Givaudan is the main supplier. In the U.S., it is benzophenones, with the largest supplier Van Dyke. The trade in Europe believes cinnamates are safer, maybe because Givaudan has promoted them so long. Who knows? Perhaps it is more a historical reason than scientific."

Just as trends are moving through the cosmetics and toiletries industry, similar sorts of changes are occurring throughout the world of ingredient suppliers. And many of them cover the general notion of safety and efficacy.

Hans Hogeweg, general manager for surfactants and additives at Akzo Chemie, explains how Akzo has tackled the problem. "In general for all our products for personal care, we can state four points," he says. "One, all new ingredients—raw materials—for cosmetics must be mild, free from dermatologically harmful by-products, causing no allergic reactions. Two, they must be at least of 99.99% purity, and free of toxicologically harmful by-products. Three, they must have high efficiency: the lower the dose, the better, as there will be lower side effects. And fourth, they must be internationally accepted or allowed. This is a huge problem. We joke that in 10 years, we will have to deal only with Unilever, Procter & Gamble, and Henkel; they will have bought up all the other cosmetics companies. We have to have material approved all through the world, so there can be international formulations. The costs of each formulation are so high, companies are getting away from local formulations. This, in turn, is a cost for us, and restricts the raw materials tremendously. But we have a global organization, and can service this.

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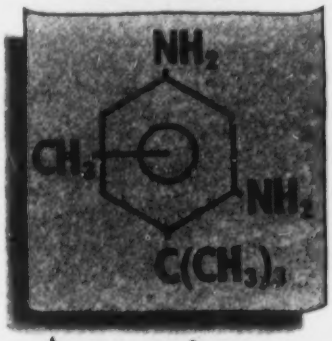

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Barbara Bordnick photo

Model applies new Avon Color line of eye pencils

another aired concerns about the use of sodium lauryl sulfate in toothpastes.

According to Karl Raabe, a product manager for Henkel's cosmetics and pharmaceuticals products group, the dioxane story is not new. "The problem of dioxane, which can be formed from ethylene oxide during the process of ethoxylation, has been known since the 1970s, and we have all been working on it, doing a lot even before that Monitor television show in September '86," he says.

"The Ministry of Health has said cosmetics shouldn't contain more than 500 ppm of dioxane. Well before 1986, the industry took relatively quite high amounts down to a better level—several thousand ppm down to about 1000 ppm. And the tendency has been to make a level of about 50 ppm acceptable."

Nowadays, he says, there are a number of different trends. For example, some cosmetics companies don't want any dioxane contamination, so they must buy the corresponding raw materials. "To avoid any dioxane, you must take those materials free of ethylene oxide—alkyl sulfates, for example, alone or in combination with amphoterics, succinates, and so on," says Raabe. "A few other surfactants may be used for this purpose, but in comparison with these, ether sulfates have a big advantage in skin and mucous-membrane compatibility."

Says Raabe: "We officially guarantee 500 ppm maximum dioxane content in our surfactants. However, research is still continuing and getting better results. We are actually far below 500 ppm, calculated on 100% active matter." For example, he says, if an ether sulfate with 50 to 100 ppm of dioxane were combined with other ingredients so that it constituted 10 to 15% of the formulation, the actual concentration would be getting close to the 10 ppm level. It is not just Henkel doing this, he adds; the industry's efforts to bring in lower dioxane levels is being driven by the industry association for textiles, leather tanning, and detergents.

As for the Monitor show on toothpaste, it was aired, as the others, only in West Germany. But the resulting controversy was picked up throughout Western Europe, with varying degrees of consumerist agitation about the surfactant. The main concern of the television show was a worry that the material is "an aggressive surfactant" that could cause a cytotoxic reaction in the mouth, or perhaps contribute to periodontal disease. Why, the show's editors asked with somewhat sinister implications, did some toothpastes have up to 7% of the surfactant,

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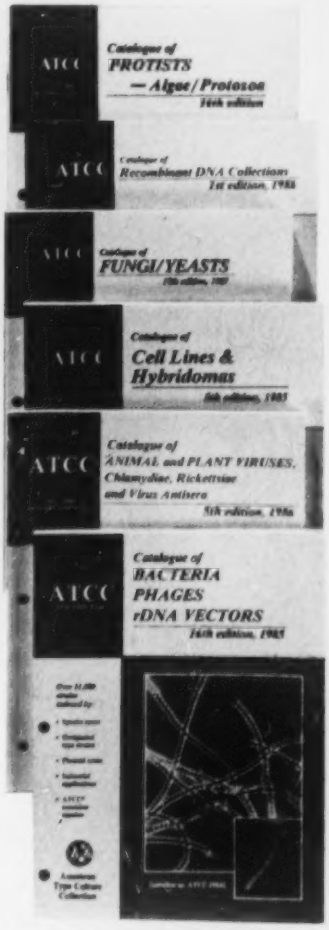

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some about 2%, when the average was 1.5%?

All toothpaste manufacturers and surfactant suppliers were distraught by the attack on sodium lauryl sulfate, which has been used for decades, worldwide, in toothpastes. Henkel, however, was probably most upset and indignant, because of the television editors' casual use of its tradename Texapon—used also for a variety of surfactants for cosmetics—as a generic term for sodium lauryl sulfate, without any indication that there are many other suppliers throughout the world. The company was also indignant over taking out of context Henkel's test data.

Says Raabe: "We use sodium lauryl sulfate as a comparison, because of its known levels of irritancy, and so on. This is quite normal. You must always look at the context of the application."

Partly as a result of these kinds of controversies, some cosmetics companies are turning even more heavily to the "natural concept." For example, in West Germany, Wella—historically a hair-care company but now diversifying into other sectors of cosmetics and toiletries—has launched a premium shampoo, Sanara, with that kind of promotion. Key to the advertising campaign: "It's not important what is in the shampoo, it's important what is not in the shampoo. More than a touch of nature."

At present, "naturals" are spotty across Western Europe, but where they have made it, they are very popular. For example, in the Netherlands, natural cosmetics at health products shops are booming. Packaged in little brown pharmacy bottles, they are sold at premium prices. And in the U.K., Body Shop, which sells naturals in attractively pared-down packaging, is one of the retailing success stories of the decade.

There still is a need, however, for scientific reinforcement. Says Martin Borchers, marketing director in Henkel's Oleochemicals Division, "The cosmetics industry definitely is becoming more sophisticated. They are looking for more detailed information. As long as dioxane, for example, is a concern, they want the analysis, with basic research data."

As the cosmetics industry itself becomes more global, suppliers must think more internationally. Walter Schlaugh, vice president and general manager of National Starch's Resins and Specialty Chemicals Division, points out that the latest generation of mousse products started in Europe, then came to the U.S., and went on to the rest of the world. "You don't know where the next one will come from," so a marketer must keep alert to possibilities, he says.

For small suppliers, that is becoming increasingly difficult, and it points out one of the structural

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weaknesses—as well as strengths—of the ingredients supply business. Only a very few of the major chemical companies have elected to put much emphasis on supplying the cosmetics and toiletries industry—firms such as ICI, BASF, Hoechst, Akzo, and Henkel. Other major firms will have one or two products that might go into cosmetics, but it is not a major effort.

Next comes a second tier of medium-sized companies, whose sales to the cosmetics and toiletries industry are important, but usually in specific areas—Witco and Stepan, for example, with surfactants, National Starch and GAF with haircare polymers, Croda with protein derivatives, and Lonza and Onyx with quaternary ammonium compounds for hair conditioning. Yet another tier consists of smaller companies that have found often quite profitable niches in supplying the industry—Reheis with antiperspirant actives, for example, or Grünau with protein hydrolysates.

Such small-niche marketers are probably even more important in Europe than in the U.S., believes ICI's Suter. One reason is the fragmentation of the cosmetics industry itself, which is still not yet conglomerated. "Our clientele is more fragmented. In the U.S., there are about 500 cosmetics makers. In Western Europe, if you take all the cottage ones, there are about 3000. That opens a niche for small suppliers, as well as the large ones. There are probably 30 major suppliers in Western Europe, compared with 10 in the U.S. Usually the local companies will have about 20 to 25% of the markets in their own locale. But the big companies don't have any more than 5 to 6% of the market, throughout the industry."

More suppliers are being bought up by larger ones. For example, Henkel in late 1986 bought Grünau, and at about the same time Union Carbide acquired specialty surfactants producer Amerchol. PPG Industries has jumped into the specialty surfactants business, acquiring Jordan Chemical and Mazer Chemicals; much of their activity is oriented toward the cosmetics and toiletries industry. Says Kline's Chandler: "There are very few pure opportunities left for raw material suppliers for cosmetics and toiletries. For a business whose overall growth hasn't been that exciting, however, a lot of people want to be in it."

Those small cosmetics firms that are left are that much more reliant on the product development talents of suppliers. Frequently, says ICI's Suter, the customers are "not very good chemists, although they may be good dermatologists. They come to us with a fancy oil, perhaps—mink oil, for example. Something difficult to formulate into something nice. We'll take it into our labs and formulate into, say, a soft cream, with a nice feel, and stable, capable of going from 50 to 60 °C on the beach, down to 0 °C in the hold of an airliner. They can then take the formulation, adjust it, add perfume, and do the packaging. That is usually their strength, the packaging—they are marketers, not chemists. They need us."

Technical service becomes all-important for suppliers, says Suter, who sees global experience important for being familiar with local raw materials, local processing conditions, and so on.

Akzo's Hogeweg would agree with that: Tech service is all. He feels it is particularly important for Akzo. "We are absolutely not integrated. We have no alcohols, no ethylene oxide. We have no large consumer outlet for captive use. We therefore try to give a little extra to all we do, a concept we call 'surfactant plus.' If someone wants a very narrow specification, for example, we can, we do, and we ask a few pennies more. We are less and less interested in supplying the detergent industry; they buy foam."

So if suppliers are giving more than foam to the cosmetics and toiletries industry, what sorts of things are they developing these days? Basically, ingredients that do things just a little bit better than before, or

CIRCLE 28 ON READER SERVICE CARD

can add a certain plus to a customer's formulation.

Isethionates, for example, are one of the fastest-growing surfactant areas, playing on the idea of mild for synthetic-detergent toilet soap bars (syndets). Such syndets have been around for years: Lever Brothers' Dove and Procter & Gamble's Zest, for example. However, new suppliers are opening up the market, beyond those two giant soap producers.

PPG's Mazer Chemicals unit, for example, has a process for sodium cocoyl isethionate, as has Akzo, the only merchant supplier in Western Europe. Akzo's Hogeweg estimates that the market for syndet bars is 44 million lb a year in the U.S., but probably less than 1 million lb in Western Europe. Normally, he says, "a product is in one place, then within six months in another. Why not with syndets? In the U.S., syndet bars are just mild, sold in supermarkets. In Europe, they are sold for dermatological problem cases, sold in pharmacies. As long as we can't change that, the market will remain small. When we can sell in the supermarkets, the market will grow."

New uses for existing products are always important. For example, ICI Americas is finding new use for its cationic surfactants as effective active ingredients in deodorant products. Its Forestall surfactant neutralizes malodors by forming a complex with the volatile odor components, proving effective in tests in reducing underarm odors. Other potential odor-reducing applications are as a deodorizer for hair-care products and mouth rinses.

Work by Croda on keratin proteins that permanently bind to the hair during the permanent wave process means, in turn, permanent conditioning, says Kevin Gallagher, marketing manager. The permanent waving process depends upon breaking and reforming cystine bonds present in hair keratin. By applying its Kerasol proteins or Croquat WKP hydrolyzed keratin proteins to the hair during this process, he says, it is possible to reform cystine bonds not only within the hair but between the hair and kerasol, creating a permanent covalent bond.

And National Starch has been adding to its families of cationic cellulose derivatives and amphoteric acrylic polymers for hair fixatives. These fixatives offer improved fixing ability while retaining good feel. Hair sprays, after years in the doldrums during the chlorofluorocarbon aerosol propellant controversy, have rebounded sharply over the past two years.

Many companies are expanding their capacities. For instance, Witco over the past two years has made a number of moves to strengthen its position in surfactants. In January, it acquired the West Coast surfactants manufacturing facility of Emery Chemicals, to get a foothold in

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the fast-growing West Coast market. A new pilot plant and oxylation facility at Houston, which started up last year, increased capabilities to custom-make surfactants. That followed an expansion of esterification and sulfonation/sulfation facilities at Houston; and an expansion of the capacity for oleochemicals at its Humko Chemical Division's Memphis and Newark, N.J., facilities.

And what at least one Western European marketer has termed "huge sulfonation capacity" has begun operating in Eastern Europe, particularly in Poland and Hungary, and in the Middle East, including Iran and Jordan. There is a resulting rising overcapacity in surfactants, he frets. Some will replace markets historically served by Western Europe's exports, and some will come into Western Europe itself; other amounts will go into the domestic markets.

Poland, for example, is cited as the largest cosmetics manufacturing country of the East-bloc countries. Hungary is said to have the best chemical and pharmaceutical industries, but in cosmetics, the Poles are furthest ahead, even supplying the Soviet Union.

Suter notes that in supplying the cosmetics and toiletries industry, "The chemistry is not all that relevant. Terrible products don't exist any more—all products are within certain limits very good. So you need to differentiate by adding service—the reason you'd go to X rather than to Y."

After all, he adds, "In cosmetics, raw materials are only a very small percentage of the total cost. Why take the risk of changing suppliers if you are happy? What we need to do is reach a threshold of credibility with customers, so that they know we can solve their problems. This is usually the beginning of a very stable relationship. It is rare to change, especially if the product is successful."

But it all comes down, in the end, to the consumer. No matter all the claims by both cosmetics formulator and supplier alike, adds Suter's colleague Walters. "If it doesn't smell good, and go on good, and feel good, it just won't sell." □

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